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EDITORIAL

Surgical Complications of Arteriovenous Fistula as Permanent Vascular Access in Patients with End Stage Renal Disease at Gezira Hospital for Renal Disease and Surgery. Revisited

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Abstract:

Background: Vascular access (VA) is a mainstay to perform an efficient hemodialysis (HD) procedure.

Objectives: To evaluate the surgical complications of AV fistula as permanent vascular access in a patient of end stage renal disease (ESRDS) at Gezira hospital for renal diseases and surgery **(**GHRDS*)***.**

Methods: Retrospective, prospective cross sectional hospital based study, done in 237 patients with end stage renal disease who underwent arteriovenous fistula.In 206 patients of the study sample done retrospectively and 31 patients of the study sample done prospectively,and they were followed for 1year. Study was conducted from September 2010 to September 2016. Data was collected using questionnaire.

Results: Sixty eight percent of study sample were males, with 42% above 50 years and 0.8% less than 10 years. Most of the patients (52.3%) were diagnosed as ESRD from the first presentation, 43.5% were diagnosed as chronic renal failure (CRF) on regular followup, while the minor rest of the patients were due to acute renal failure(ARF) which progressed to end stage renal disease.The complications rate was 32.8% (n=82), perioperative complications were 9.3% (n=22) represented as infections 3.8% (n=9), bleeding 3.0% (n=7), stenosis 1.7% (n=4), thrombosis 0.8% (n=2). The late complications were 23.18% (n= 60) the commonest was pseudo aneurysmal 19.4% (n=46) followed by venous HTN 0.8% (n=2) and steal syndrome 0.4%(n=1), skin necrosis 0.4%(n=1), idiopathic stop function 2.1% (n=5), thrombosis 0.4% (n=1).

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Conclusion: Permanent arteriovenous fistula is the best option for haemodialysis in patients with end stage renal disease. The commonest complication was puncture site pseudo aneurysm.

Key words: Surgical complications; arterio-venous fistula; vascular access, end stage renal disease.

Introduction:

Access to the vascular system is necessitated by the therapy required for the complex medical conditions that occur in patients with ESRD [(1)]. Georg Haas (Giessen, Germany) in 1924 performed the first hemodialysis treatment in humans which lasted 15 minutes, he used glass cannula to obtain arterial blood from the radial artery, which he returned to the cubital vein. Later he performed a surgical cut-down to place a canula in to the radial artery and into an adjacent vein.[(1)]In 1960 Shaldon introduced hand-made catheters into the femoral artery and vein by the percutaneous Seldinger technique for immediate vascular access. [(1)] James E. Cimino and et al (1962) described a 'simple venipuncture for hemodialysis based in experience of Dr. Cimino when he worked part-time as student at Bellevue transfusion center in New York. [(2)]

In 1966 the legendary paper 'Chronic hemodialysis is using venipuncture and a surgically created arteriovenous fistula' was published by Brescia, Cimino, Appell and Hurwich, Dr Appell was the surgeon in the team. The first surgically created fistula for the purpose of hemodialysis was placed on 19 February 1965, followed by further 14 operations as of 21 June1966. Twelve out of these 14 AV fistulae resumed primary function without complications, two never functioned (in the first patient, the anastomosis 'was made too small'). Dr Cimino stated that 'the decision to connect an artery and vein subcutaneously, thus creating an internal shunt, appeared not only logical but was the classic example of necessity as the mother of invention' and 'that arteriovenous fistulas could lead to heart failure, and this would be particularly hazardous in patients whose cardiovascular systems were already compromised. [(3)]

Gezira Hospital for Renal Disease and Surgery is one of the famous specialized centers in Sudan that offer this type of surgery regularly. The aim of the study was to evaluate the outcome and the complication of permanent vascular access for dialysis as a revisited topic.

Pateints and Methods:

Retrospective, Prospective, cross sectional hospital based study, was done in patients with end stage renal disease who underwent arteriovenous fistula and on regular hemodialysis. The study was conducted at Gezira Hospital for Renal Disease and Surgery (GHRDS), from September 2010 to September 2016. A total of 237 patients underwent AV fistula during the study period, the study was done retrospectively in 206 patients and prospectively in 31 patients. Patients were followed for 1year.

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Verbal consent was obtained from the patient. The operation was done with the patient lying supine. the upper limb was abducted on the table. Local anaesthesia 10ml of lidocaine 2% was injected subcutaneously at the site of fistula, small longitudinal incision 6-8cm was made just lateral to the radial artery, but in case of proximal fistula transverse incision was made in the cubital fossa. Cephalic or basilic veins were identified and the proximal part was clamped after injection of 10 ml of normal saline 0.9% to ensure the distal patency of the selected vein. Then the vein was posteriorly spatulated after ligation of the distal part. After mobilization of the artery, clamps were applied and anterior arteriotomy was made about 5mm. Then end-end anastomosis was made between the artery and the vein, the suture material used was 6/0 propylene (continuous-tension free). The patient was advised to start physiotherapy immediately, so as to increase the venous flow and maintain the fistula functioning. The patients were seen in the referred clinic after one week to look for the wound and the function of the A-V fistula then every 3months for 1year.

Postoperative doppler ultrasound (U/S) was done only for the suspected non-functioning access (no thrill or bruit) or diagnosis of complications (thrombosis -venous aneurysm- spasm-steel syndrome).

Questionnaire was used for data collection followed by data entry using Excel (Microsoft) master sheet and then analyzed by SPSS (Statistical Package for Social Science); version 20, software for statistical analysis.

Results:

Sixty eight percent of the study sample were males, with 42% above 50 years and 0.8% less than 10 years. About 62.9% of the patients reside in Wad Medani and 52.3% of study patients were diagnosed as end stage renal disease(ESRD), while 43.5% chronic kidney disease (CKD) and the remaining 4.2% were acute renal failure (ARF) which progressed to ESRD as shown in figure 1. The majority of the patients (80.07%) had temporary vascular access (jugular-femoral) before establishing the permanent access.

The fistula site was snuff box in 5.9%, forearm 27%, wrist (Brescia Cimino) 3.37% and cubital fossa 63.7%. In 94.1% they were functioning immediately (presence of thrill or bruit).

The complications occurred in 34.2% of the patients. Perioperative complications developed in 9.3%of the patients, they were bleeding, thrombosis,stenosis and infections,idiopathic non-functioning (3%,2.1%,1.2%,1.7%,3.8%,2.1% respectively) as shown in figure 2.

The late complications about 24.9% including pseudoaneurysm aneurysm (puncture site), venous HTN, steal syndrome, skin necrosis (19.4%, 0.8% ,0.4% ,0.8% respectively) as shown in figure 3.

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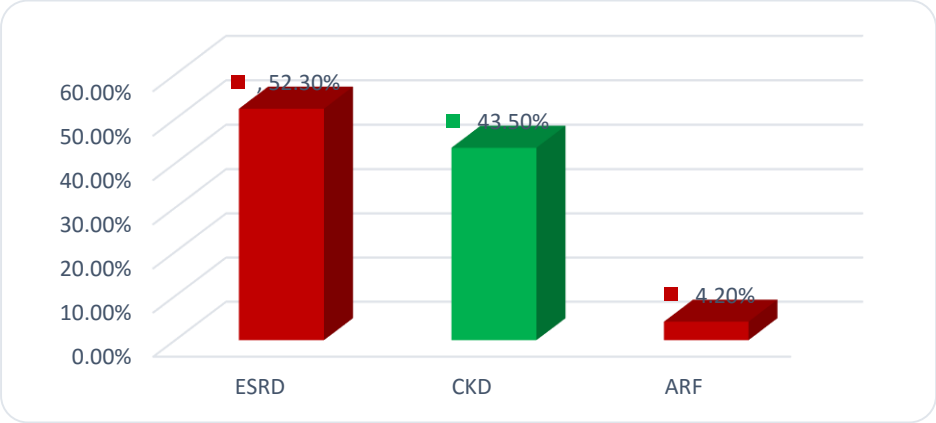

Figure (1):Indications of permanent vascular access in patients with end stage renal disease at Gezira Hospital for Renal Disease and Surgery (GHRDS)

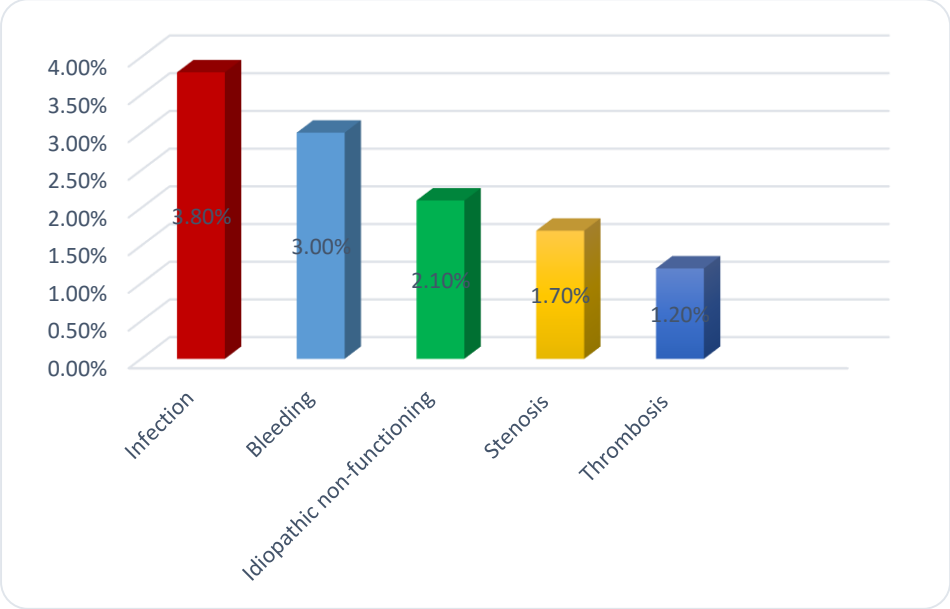

Figure (2):Perioperative complications of permanent vascular access in patients with end stage renal disease at Gezira Hospital for Renal Disease and Surgery (GHRDS)

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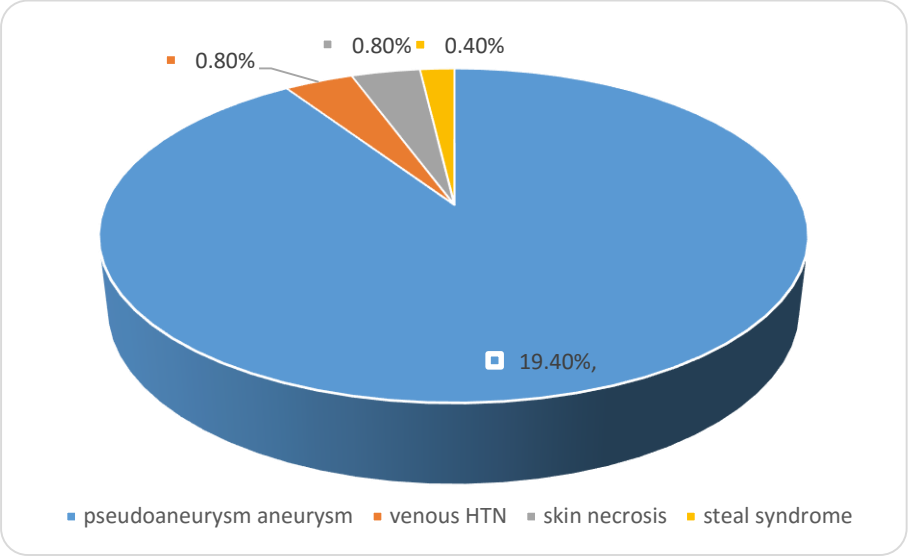

Figure (3):late complications of permanent vascular access in patients with end stage renal disease at Gezira Hospital for Renal Disease and Surgery (GHRDS)

Discussion:

Establishing and maintaining a native Arterio-venous(AV) fistula is essential for hemodialysis(HD) in ESRD. The entire patients had a native AV fistula and the majority were diagnosed as ESRD(52.3%). In the current study most of the patients were on hemodialysis by temporary access before planning the permanent vascular access (AV fistula). This study agreed with study carried at GHRDS in 2007 which showed the majority of the patients 91.8% had AV fistula after an established HD. [(4)]This result reflect the relation between the long period of dialysis with native fistula and repetitive puncture in fistula may participates to the development of complications such as aneurysm and thrombosis. This result was matching with the study done in Serbia 2013 which showed that the long duration of hemodialysis the more site puncture pseudo aneurysm [(5).]

Evaluation of patients before creation of AV fistula is a very important step including history and exanimation and investigations like venous map and duplex U/S according to international guideline. In the recent study doppler ultrasound was used only after suspicious of development of complications but not done routinely preoperatively for vascular mapping.

The common site of AV fistula in this study was cubital fossa 63.7% followed by distal forearm was 27%. A study done at GHRDS in 2007 showed, the radio-cephalic fistula (distal forearm) was the common site (78.1%) followed by cubital fossa (20. 5%).There was diversity between the two studies reflecting total change of practice by the junior staff towards the cubital fossa more than the distal forearm due to many factors e.g. big veins, easy access and high success rate, but on the other hand it had more complications and most of the time needs superficalization.

In another study done in India in Deenanath Mangneshkar Hospital a total of 271 fistula was created in 249 patients· basilic vein used in 77(28.4%) cases and cephalic vein in 186 (68.6%) cases and antecubital vein in 8 (3%) cases [(8)].

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In this study the complications rate was 33.4%,perioperative complications were 9.5% and the late postoperative complications were 23.9% with puncture site pseudo aneurysmal as the commonest complication accounting for 19.4% (n=46). The result was comparable with other local study done at GHRDS-2007,which revealed ; complication rate was 32.9% and only 5.5% they developed pseudo aneurysm postoperatively [4], these results are consistent with this study apart from the high rate of aneurysm in the current study, which can be explained by the difficult puncture in the cubital fossa which need multiple trial of punctures and usually need superficalization to made the access easy, in contrast distal forearm needs less number of punctures and hence less complications. In recent retrospective study done in USA the complications rate was 16% (36.01 % perioperative- 63.98% late postoperative) and the commonest complications were aneurysm and thrombosis (26.5 %,12.7%respectively).[9]

The high rate of complications in the recent study in comparison to the literature can be attributed to most of our patients were elderly with many comorbidities (like diabetes mellitus and hypertension), operators experience, lack of trained nurses and lack of physiotherapy

Conclusion:

Permanent arteriovenous fistula is the best option for hemodialysis in patients with end stage renal disease. The commonest complication was puncture site pseudo aneurysm.

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